PATENT CLAIMS

1. Method for the manufacturing of a plate (2) of metal or of a ceramic material, the plate comprising one or more fields (3) which occupy the major part of the surface of the plate and which on at least one side of the plate is high relief patterned, more specifically patterned such that the plate on said at least one side within the area of said field or fields has/have reliefs with high projections and deep valleys (9) or recesses (8) alternatingly, and between the sides a thin web (10), said high relief patterned field or fields being at least partly bordered by broad edge portions (4) which have a thickness larger than the mean thickness of the plate within the region of said high relief patterned field or fields, c h a r a c t e r i s e d in

- that in at least one preliminary step an intermediate product (1) is manufactured, the intermediate product comprising a first portion (11) which shall form said high relief patterned field(s), which however is(are) not yet high relief patterned but contain(s) a quantity of material essentially corresponding to the quantity of material existing within said field(s) of the finished plate, and second portions (12) which shall form said edge portions and which contain substantially the quantity of material that shall exist in those portions of the finished plate,

- that the intermediate product is placed between at least two engraved moulding tool parts (30, 31), which are movable relative to one another, at least one of said moulding tool parts being high relief engraved and at least one being a punch (31), said tool parts, when they are maximally brought together, forming between them and/or together with at least one or more tool parts, a mould cavity corresponding to the final shape of the finished plate within the regions of said high relief patterned field(s) and at least near the final shape of said edge portions,

- and that the high relief pattern within the region/regions of said field(s) is established by striking the engraved tool parts against one another, at least said punch being stricken against said intermediate product wherein the material within the regions of said at least one first portion is caused to flow and fill the mould cavity to establish said high relief pattern essentially without transportation of material between said first and second portions.

2. Method according to claim 1, c h a r a c t e r i s e d in that in connection with the manufacturing of the high relief pattern, an impact member is stricken against at least said punch, which transfers impact energy to the intermediate product (1).

3. Method according claim 1 or 2, c h a r a c t e r i s e d in that the manufacturing of the intermediate product involves powder technological manufacturing of a green body,

which is sintered through heating so that the powder grains coalesce to form an essentially consolidated body.

4. Method according to claim 3, c h a r a c t e r i s e d in the powder grains of the starting material are mechanically connected with one another in connection with the manufacturing of the green body.

5. Method according to any of claims 1-4, c h a r a c t e r i s e d in that the manufacturing of the intermediate product is carried out through pressing powder in a tool, which comprises at least one punch that is subjected to impact action, so that kinetic energy to such a degree is transferred via the punch to the powder that the powder is caused to plasticise.

6. Method according to any of claims 1-4, c h a r a c t e r i s e d in that the manufacturing of the intermediate product is carried out by pressing powder in a tool, which comprises at least one punch which with such a high pressure is pressed against the powder that the powder is plasticised.

7. Method according to claim 1, c h a r a c t e r i s e d in that the manufacturing of the intermediate product is carried out by pressing powder in a tool, which comprises at least one punch that is stricken against the powder with such a high pressure that the powder grains plasticise to form an essentially consolidated body.

8. Method according to any of claims 3-7, c h a r a c t e r i s e d in that the forming of the intermediate product in the form of a green body or consolidated body is carried out in a plurality of steps.

9. Method according to any of claims 3-8, c h a r a c t e r i s e d in that the powder is preheated to at least 70°C prior to forming the intermediate product in one or more operations.

10. Method according to any of claims 1-9, c h a r a c t e r i s e d in that in connection with the manufacturing of the intermediate product, a first engraved tool part, which is a lower tool part, is stationary and forms a counter punch, and that a second engraved tool part, which is a punch, is stricken or pressed against the counter punch, which contains the powder which shall form the intermediate product.

11. Method according to any of claims 1-10, c h a r a c t e r i s e d in that in connection with the intermediate product, the two tool parts, which are movable relative to one another, are stricken or pressed against one another, one of them from above and downwards and the other one from below and upwards relative to the surroundings.

12. Method according to any of claims 1-11, c h a r a c t e r i s e d in that the manufacturing of the intermediate product is carried out in a moulding tool, which is charged with so much material that its net volume corresponds to at least the volume of the space of a mould cavity for the final forming of the plate, that the intermediate product then is manufactured through one or more impact operations, wherein any possible surplus material within any of said first and second portions is pressed over to that portion or those portions where there is/are a deficit of material for the achievement of said intermediate product, in which at least said first portion contains a quantity of material which essentially corresponds to the quantity of said high relief patterned field of the finally shaped plate.

13. Method according to claim 1, c h a r a c t e r i s e d in that the intermediate product is manufactured through plastic working of a flat plate, which contains at least the quantity of material that shall be included in the finished plate, and that, in connection with the plastic working, material is caused to flow out from said at least a first portion, which shall form said high relief patterned field, to said second portions which shall form said edge portions, so that the remaining quantity of material within the region of said at least a first portion essentially corresponds to the quantity within said high relief patterned field of the finished plate, and so that the resulting quantity in the region of said second portions will contain at least that quantity which shall be included in those portions of the finished product.

14. Method according to claim 1, c h a r a c t e r i s e d in that the intermediate product is manufactured by machining a plate within at least the first portion that shall form said high relief patterned field, so that said portion will contain essentially the quantity of material which corresponds to the quantity within said field/fields of the finished plate.

15. Method according to any of the previous claims, c h a r a c t e r i s e d in that said edge portions are formed in the space of the mould cavity of the material within said second portions, at the same time as said high relief pattern is being formed.

16. Method according to claim 15, c h a r a c t e r i s e d in that surplus material in said second portions of the intermediate product is pressed out from the mould cavity in a partition plane between the tool parts or to particular expansion spaces as the high relief pattern and said edge portions are being formed, and that the material that has been pressed out is then removed by skegging the obtained plate.

17. Method according to any of claims 1-16, c h a r a c t e r i s e d in that, in connection with the forming of the high relief pattern, a lower engraved tool part, which contains the intermediate product and forms a counter punch, is placed on an anvil and that an upper tool part, which is an embossing punch is stricken against the counter punch.

18. Method according to claim 17, c h a r a c t e r i s e d in that the unit which consists of the anvil and a tool unit which contains the counter punch is movable and is caused to move upwards at the same time as the punch is stricken downwards, wherein the masses and velocities of the units which are movable from upwards and from below are such that their momentums, i.e. the products of mass multiplied by the velocity are essentially equal when the movable units meet.

19. Method according to any of the previous claims 1-18, c h a r a c t e r i s e d in that the finally shaped plate is heated to sintering temperature in a subsequent operation for elimination of any possible remaining pores in the material.

20. Method according to any of the previous claims, c h a r a c t e r i s e d in that said material consists mainly of any of the following materials: graphite or other ceramic material, stainless steel, titanium, aluminium, magnesium, or other light metal, or of a combination of two or more of said materials.

21. Plate manufactured according to any of claims 1-20.

22. Plate according to claim 21, c h a r a c t e r i s e d in that it consists of a plate of the kind that is included in fuel cells to contribute to the separation of different gases, transportation of residual products and to conduct current generated from the fuel cell.

23. Plate according to claim 21, c h a r a c t e r i s e d in that it consists of a plate of the kind that is included in heat exchangers.